

AMSER Case of the Month

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37-year-old female presents with an
acute onset of frontal headaches

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Patient Presentation

HPI: 37-year-old female, with a history significant for migraines, presents to the emergency room with a two-week history of frontal headaches, which are different than her usual migraine headaches, associated with photophobia, nausea, and vomiting.

PMH: Migraines without aura associated with menstrual cycle

Medications: baclofen (LIORESAL), levonorgestrel-ethinyl estradiol, ubrogepant (UBRELVY)

Allergies: Penicillin, Sulfa Drugs

Vitals: BP: 131/92 mmHg, HR: 102, RR: 16, SpO2%: 100%, Temp: 97.9°F

Physical Exam: Normal

Patient Presentation

Pertinent Laboratory Findings

Complete Blood Count (CBC) with Differential

Normal Hemoglobin (12.6 g/dL)

↑ WBC ($18.49 \times 10^3/\mu\text{L}$)

↓ RBC ($3.93 \times 10^6/\mu\text{L}$)

Normal Platelet Count ($243 \times 10^3/\mu\text{L}$)

Basic Metabolic Panel (BMP)

Normal Sodium (141 mmol/L)

Normal Potassium (4.7 mmol/L)

Normal Creatinine (0.81 mg/dL)

Normal Glucose (87 mg/dL)

Coagulation Profile

Normal Prothrombin Time (PT) (13.4 s)

Normal International Normalized Ratio (INR) (1.2)

↑ Partial Thromboplastin Time (PTT) (79.2 s)

↑ Thrombin Time (150.0 s)

What Imaging Should We Order?

ACR Appropriateness Criteria Headache

Headache

Variant 1: Sudden onset severe headache that reaches maximal severity within one hour. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
CT head without IV contrast	Usually Appropriate	☼☼☼
CTA head with IV contrast	May Be Appropriate	☼☼☼
Arteriography cervicocerebral	Usually Not Appropriate	☼☼☼
MRA head with IV contrast	Usually Not Appropriate	○
MRA head without and with IV contrast	Usually Not Appropriate	○
MRA head without IV contrast	Usually Not Appropriate	○
MRI head with IV contrast	Usually Not Appropriate	○
MRI head without and with IV contrast	Usually Not Appropriate	○
MRI head without IV contrast	Usually Not Appropriate	○
MRV head with IV contrast	Usually Not Appropriate	○
MRV head without and with IV contrast	Usually Not Appropriate	○
MRV head without IV contrast	Usually Not Appropriate	○
CT head with IV contrast	Usually Not Appropriate	☼☼☼
CT head without and with IV contrast	Usually Not Appropriate	☼☼☼
CTV head with IV contrast	Usually Not Appropriate	☼☼☼

This imaging modality was ordered by the ER physician.



Findings (Unlabeled)



Findings (Labeled)

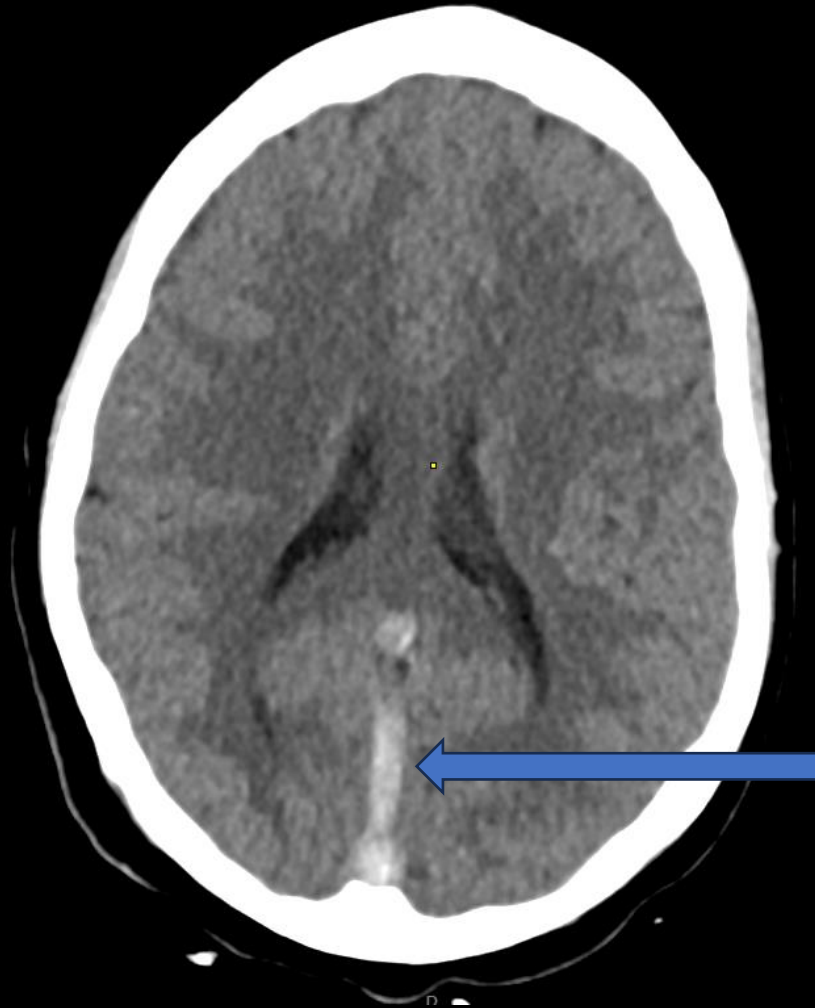


Hyperdensity in the
left transverse sinus

Findings (Unlabeled)



Findings (Labeled)

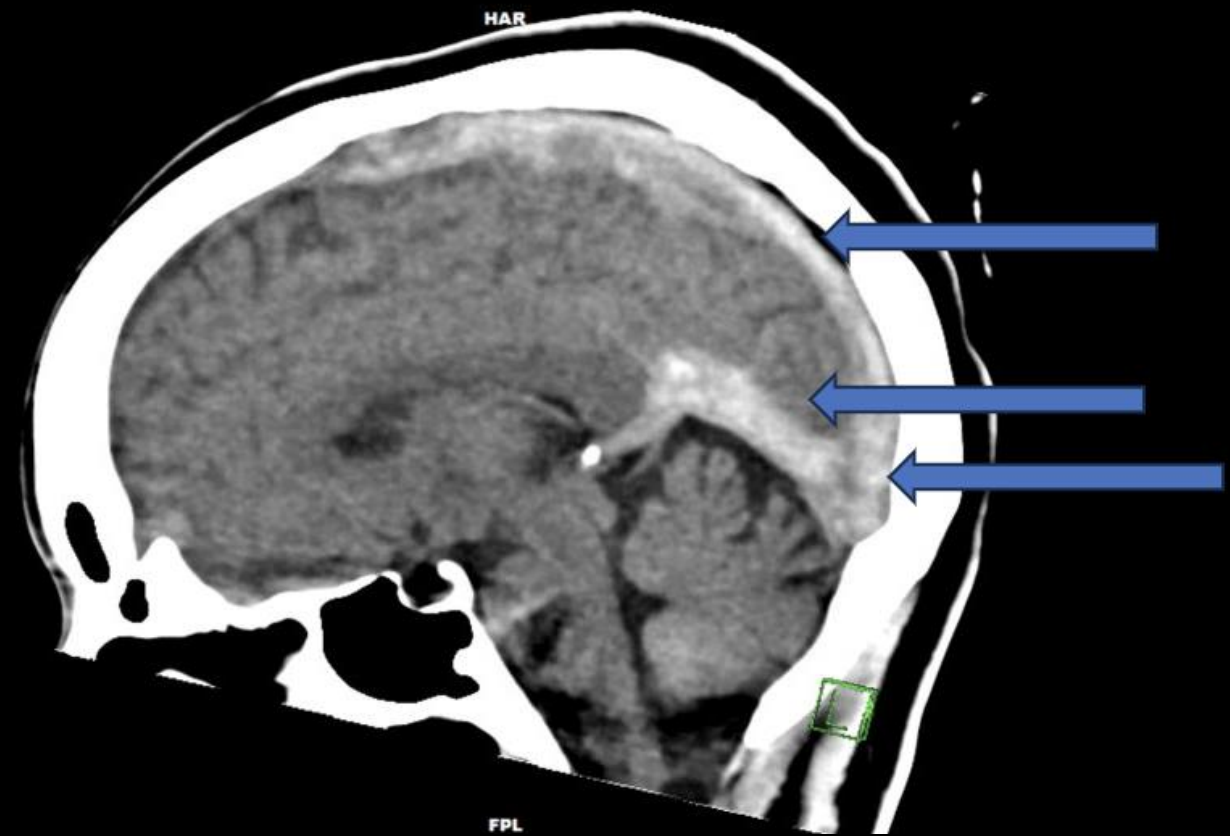


Hyperdensity in the straight sinus

Findings (Unlabeled)



Findings (Labeled)



Hyperdense superior sagittal sinus, straight sinus, and torcula

Differential Diagnosis

1. Dural Sinus Thrombosis
2. Subdural Hematoma
3. Hemoconcentration
4. Retained Contrast Material

Final Diagnosis:

Dural Venous Sinus Thrombosis

Patient Discharge and Outpatient Follow-Up

- The patient was started on anticoagulation therapy and discharged from the hospital.
- She is being followed by outpatient neurology.
- Three months after the initial scan, the outpatient neurologist ordered follow-up imaging to assess the treatment response.

What Additional Imaging Should We Order?

ACR Appropriateness Criteria

Venous Sinus Thrombosis

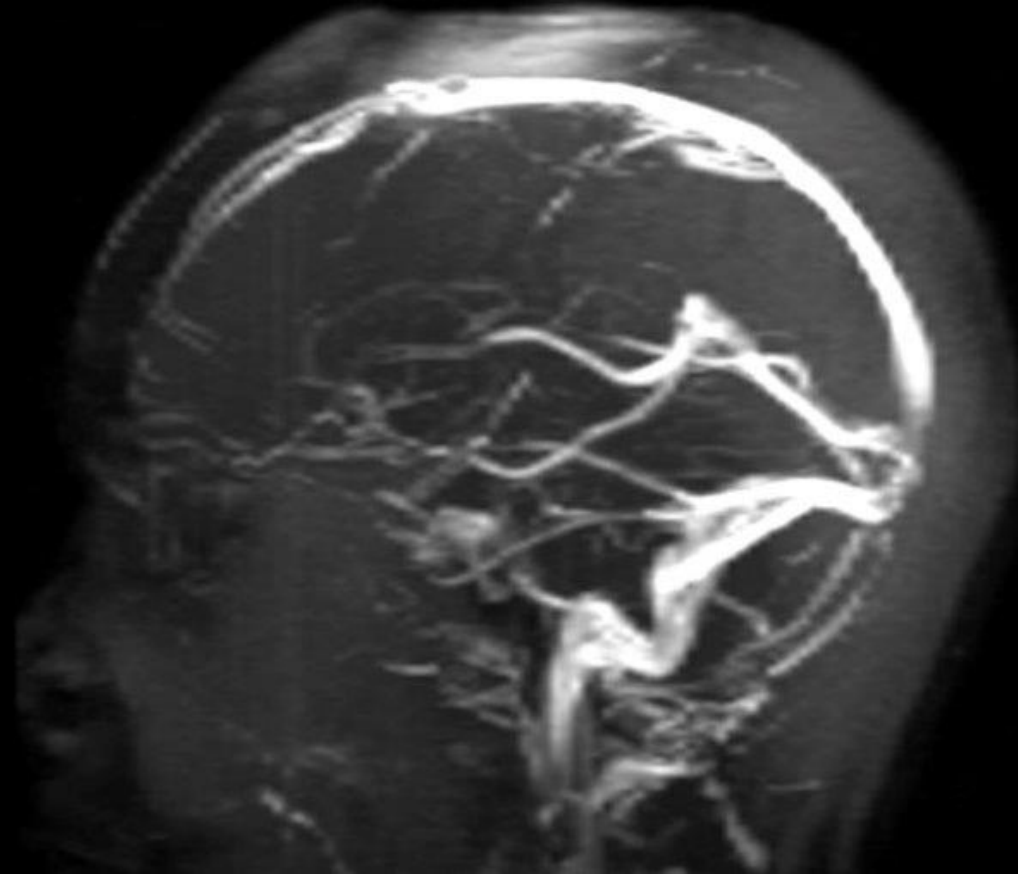
Variant 8: Adult. Known venous sinus thrombosis. Surveillance imaging.

Procedure	Appropriateness Category	Relative Radiation Level
MRI head without and with IV contrast	Usually Appropriate	0
MRI head without IV contrast	Usually Appropriate	0
MRV head without and with IV contrast	Usually Appropriate	0
MRV head without IV contrast	Usually Appropriate	0
CT head without IV contrast	Usually Appropriate	⊕⊕⊕
CTV head with IV contrast	Usually Appropriate	⊕⊕⊕
US duplex Doppler carotid artery	Usually Not Appropriate	0
US duplex Doppler transcranial	Usually Not Appropriate	0
Arteriography cervicocerebral	Usually Not Appropriate	⊕⊕⊕
MRA head without and with IV contrast	Usually Not Appropriate	0
MRA head without IV contrast	Usually Not Appropriate	0
MRA neck without and with IV contrast	Usually Not Appropriate	0
MRA neck without IV contrast	Usually Not Appropriate	0
MRI head perfusion with IV contrast	Usually Not Appropriate	0
CT head perfusion with IV contrast	Usually Not Appropriate	⊕⊕⊕
CT head with IV contrast	Usually Not Appropriate	⊕⊕⊕
CT head without and with IV contrast	Usually Not Appropriate	⊕⊕⊕
CTA head with IV contrast	Usually Not Appropriate	⊕⊕⊕
CTA neck with IV contrast	Usually Not Appropriate	⊕⊕⊕

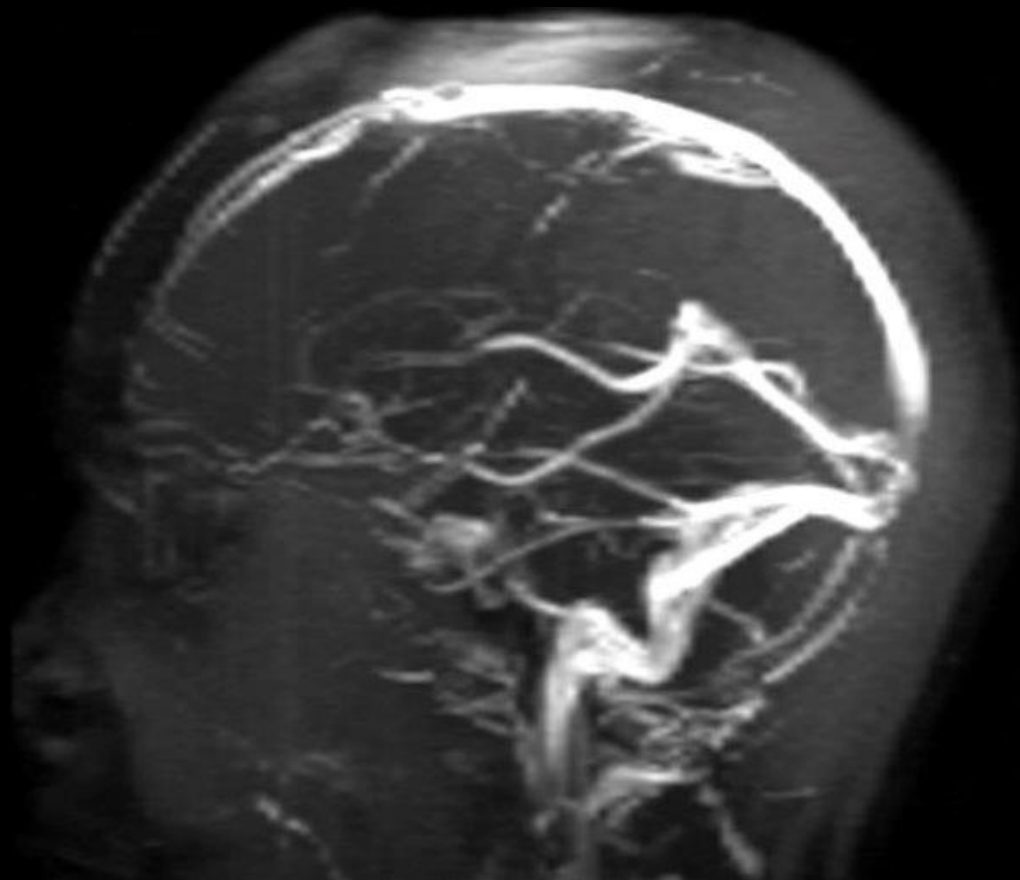


This imaging modality was ordered by the outpatient neurologist.

Findings (Unlabeled)



Findings (Labeled)



Interval improvement in the extensive dural venous sinus thrombosis status post anticoagulation therapy

Findings (Unlabeled)



Findings (Labeled)



Interval improvement in the extensive dural venous sinus thrombosis status post anticoagulation therapy

Dural Venous Sinus Thrombosis

History of Cerebral Venous Thrombosis:

- Cerebral venous and sinus thrombosis was first detailed in the medical literature by French physician, Ribes, in 1825.¹
- Dr. Ribes treated a 45-year-old male patient who died following a 6-month history of delirium, headaches, and seizures.²
 - Autopsy findings supported thrombosis of the left lateral sinus, parietal cortical vein, and superior sagittal sinus.²
- Cerebral Venous Thrombosis (CVT) is a rare condition that occurs following a thrombotic obstruction of the dural sinuses or the cerebral veins.³
 - Considered a cerebrovascular emergency³
- This can lead to hemorrhages, or ischemic lesions, in the brain.³

Dural Venous Sinus Thrombosis

History:

- Dural Venous Sinus Thrombosis (DVST) refers to the formation of a blood clot located within the venous lumen of the cerebral sinus.⁴

Clinical Presentation:

- Patients can present with a variety of signs and non-specific symptoms including:⁵
 - Headache
 - Intracranial Hypertension
 - Cranial Nerve Dysfunction
 - Focal or Generalized Seizures
 - Subarachnoid Hemorrhage
 - Focal Neurological Deficits
 - such as Bilateral Papilledema
 - Unexplained Altered Mental Status
 - such as Delirium or Amnesia

Dural Venous Sinus Thrombosis

Epidemiology:

- Estimated incidence of approximately 3 to 4 cases per million among adults and approximately 7 cases per million among children (including neonates)⁴
 - Dural Venous Sinus Thrombosis (DVST) is rare.
- DVST accounts for 1-3% of all strokes.⁶
- DVST most commonly affects the superior sagittal sinus (70-80%), as well as the transverse and sigmoid sinus (70%).⁷
- Venous Sinus Thromboses have a female preponderance.⁵
 - The prevalence has a female-to-male ratio ranging from as high as 3:1 to as low as 1:1.⁵

Dural Venous Sinus Thrombosis

Pathophysiology:

- DVST often develops following increased intracranial pressure.⁸
 - Due to the impairment of venous drainage or focal neurodeficits from hemorrhage or venous infarction⁸

Etiology:

- Cerebral Venous Sinus Thrombosis is more common in women.²
 - Due to the use of oral contraceptive medication, pregnancy, and puerperium²
- Other risk factors include (but are not limited to):⁹
 - Dehydration
 - Head Injury
 - Hematological Disorders
 - Hormone Replacement Therapy
 - Infection (e.g., Mastoiditis, Meningitis, and Sinusitis)

Dural Venous Sinus Thrombosis

Diagnostic Imaging:

- Digital Subtraction Angiography (DSA)
 - Recognized as the reference standard for the diagnosis of vein thrombosis and dural sinus patency⁹
 - Invasive imaging method
- Noncontrast Computed Tomography (NCCT)
 - First radiologic examination most often utilized to evaluate Dural Venous Sinus Thrombosis (DVST)⁹
 - Due to its production of rapid results and broad accessibility⁹
- Computed Tomography Venography (CTV)
 - When concerned for venous sinus thrombosis, a CTV is commonly performed to confirm patency.
- Following NCCT, a diagnosis of DVST is either confirmed or excluded with Magnetic Resonance Imaging (MRI).⁹
- Magnetic Resonance Imaging (MRI) with Magnetic Resonance Venography (MRV)
 - Most specific imaging technique performed for a diagnosis of DVST⁴

Dural Venous Sinus Thrombosis

Treatment:

- Treatment options for Dural Venous Sinus Thrombosis (DVST) consist of the following: ⁴
 - Anticoagulation Therapy
 - Commonly includes adjusted subcutaneous Heparin or body weight adjusted subcutaneous Low Molecular Weight Heparin (LMWH)⁴
 - Following treatment with Heparin, Warfarin and other oral anticoagulants can then be substituted to maintain an International Normalized Ratio (INR) between 2 and 3.⁴
 - Endovascular Thrombolysis
 - Can be performed with thrombolytic enzymes such as urokinase or streptokinase⁴
 - General Supportive Measures

References

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